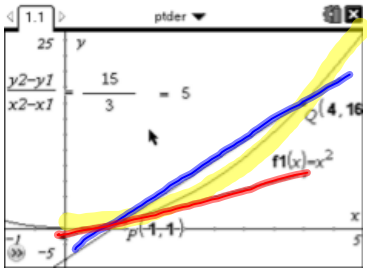
2.4b Instantaneous Rate of Change

Estimate the instantaneous velocity at t=1



rh dq

slope of $\overline{PQ}$ = average rate of change

slope of tan = instantaneous rate of change

= limiting value of the slope of $\overline{PQ}$ as $Q \to P$

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Find the exact instantaneous velocity at t=1

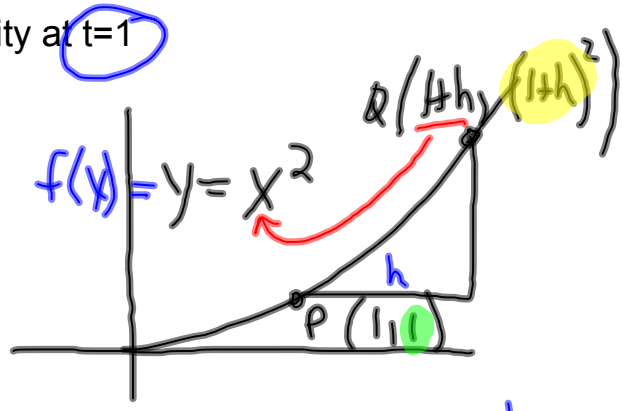
$$\lim_{h\to 0}\frac{f(1+h)-f(1)}{h}$$

rh dq

$$\lim_{h\to 0}\frac{(1+h)^2-1}{1+h-1}$$

$$\lim_{h\to 0}\frac{1+2h+h^2-1}{h}$$

$$\lim_{h\to 0}\frac{h(2+h)}{h} = 2$$



h = Δx

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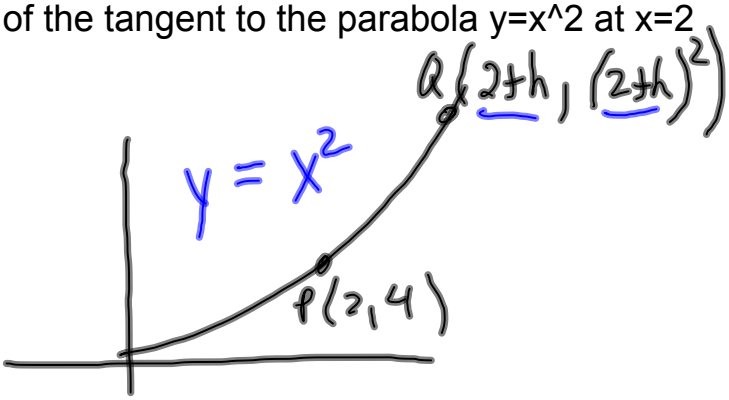
Example 3 Find the equation of the tangent to the parabola y=x^2 at x=2



$$\lim_{h\to 0} \frac{(2+h)^2 - 4}{2+h-2} = ?$$

$$\lim_{h\to 0} \frac{4+4h+h^2-4}{h}$$

$$\lim_{h\to 0} \frac{h(4+h)}{h} = 4$$

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Example 5 Find an equation for the normal to the curve y=4-x^2 at x=1

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Example 6 Find the speed of a falling rock at t=1 if the distance it falls is y=16t^2

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